

POP-UP SPORTS TRAINING ASSEMBLIES, AND RELATED DEVICES AND METHODS

FIELD OF THE INVENTION

0001] The present invention pertains generally to portable traps and goals for use in sports training, and particularly to portable traps and goals which can be erected easily, for example, via self-erecting components. Traps and goals of the invention are highly visible, and effectively trap or stop sports-playing objects such as golf balls, hockey pucks, lacrosse balls, softballs, baseballs, footballs and soccer balls. The invention relates also to frames which can be provided in easily erectable or self-erecting embodiments, and which are useful not only as sports traps or goals but also for displaying signage, and particularly for displaying temporary or emergency signage.

BACKGROUND OF THE INVENTION

0002] Many games utilizing a sports object, such as a soccer ball, hockey puck, golf ball or lacrosse ball are often played informally in fields and areas which do not have standard goal structures. Because such games are often impromptu gatherings, it is difficult and usually impossible for the players to bring conventional, full-size, goals which are difficult to transport and, for the most part, are typically installed in permanent locations on sports or recreational fields. In such situations, players often use non-standard or makeshift structures as traps for game-playing objects or goals, such as stakes, T-shirts, traffic pylons or any visible object which can be used to define a goal face or area for the purpose of the game. For example, if soccer is played or other similar sport where the ball must pass within the margins of a goal in order to score points, the ball can be directed between two markers in order to provide a delimited area useful for scoring. Because such delimited areas have uncertain or unclear boundaries, disagreements can arise among players as to whether points have been scored based on whether the ball or other sports playing object has passed outside or above the goal area.

[0003] To address the above concerns, portable sports goals have been developed in the sports field, such as, for example, the Adjustable Soccer Goal of Moosavi, U.S. Pat.

No. 5,080,375; the Portable Soccer Goal Apparatus of Borazjani, U.S. Pat. No. 5,000,461; and Portable Soccer Goal of Caruso *et al*, U.S. Pat. No. 4,407,507; and Portable Soccer Goal of Pennell, U.S. Pat. No. 4,127,272. The inventions of Pennell and Caruso *et al*. employ a system of triangular braces or straight line framing pieces. Some of these goals utilize separate parts which are assembled into a goal framework. Some portable sports goals have features which cause the ball to rebound out of the goal such as the device found in U.S. Pat. No. 5,048,844 to Haseltine, or have elements which return the ball in a particular way, such as that found in U.S. Pat. No. 4,286,786 of Papadopolis.

[0004] Portable goals are found also in the inventions of Armell. For example, in the invention shown in U.S. Pat. No. 5,244,213 to Armell, base and upright poles are interconnected with both a tensioned net member and means for pulling the ends of the poles so that they become arcuately bowed to form the horizontal base and upright mouth of the goal. Thus, the net member of Armell '213 is disposed under tension, thereby tending to eject a sports object which is driven or thrown into it. Similarly, U.S. Pat. No. 5,433,433 to Armell discloses a Flexible Sports Goal which is adapted and arranged such that the relative position of the face frame in relation to the base of the device is controlled primarily by the netting which is suspend therebetween, and by a strap or other means disposed either or both between the front corners of the device, or between the face frame and the base frame of the device. The relative position of the face of the Armell '433 goal with respect to its base is thus determined by the netting element, a strap means, or both. Thus, a disadvantage of portable goals in the art is that, because their netting elements are under tension, they tend to reflect or eject a ball or other sports object out and away from the goal or trap. Because of this, there is a need in the art for a light-weight and portable trap or goal for receiving a sports playing object, such as a ball, in such a manner that the ball tends to remain with the confines of the goal when driven or thrown into it.

SUMMARY OF THE INVENTION

[0005] It is therefore an object of the invention to provide lightweight and portable trap frames suitable for holding a net element or the like for receiving or trapping game playing objects.

[0006] It is a further object of the invention to provide such traps further comprising netting elements or the like, which netting functions to effectively stop the game playing object when it is thrown or driven into the trap.

[0007] It is also an object of the invention to provide frames for such portable traps whereby the upright and base frame elements maintain their relative positions with respect to one another relatively independent of the disposition of a netting element.

[0008] It is similarly an object of the invention to provide frames and traps which comprise connectors that are constructed and arranged to dispose the frames and traps of the invention into easily foldable configurations.

[0009] In accordance with these and other objects, a trap frame for holding a net element disposed for receiving a sports object is provided, the trap frame comprising a face frame, the face frame preferably comprising a resilient archable member having a face frame first end and a face frame second end disposed for connection to a connector, a base frame, the base frame comprising a resilient archable member having a base frame first end and a base frame second end, a first connector disposable for connecting the base frame first end to the face frame first end, and a second connector disposable for connecting the base frame second end to the face frame second end, wherein the first and the second connectors are constructed and arranged to determine the relative positions of the face frame with respect to the base frame. Thus, the relationship of the plane formed by the face frame and the plane formed by the base frame is primarily determined by how the connectors are constructed, arranged and disposed with respect to the resilient archable members.

[0010] Although the connectors can be of any configuration that is constructed and arranged to hold the face frame and base frame in desired relation to one another, preferably the first and second connectors comprise one or more of curved connectors, spiral connectors, connectors forming a right angle, bracketed connectors forming a right angle, connectors forming an acute angle, bracketed connectors forming an acute angle, connectors forming an obtuse angle, bracketed connectors forming an obtuse angle, and connectors constructed and arranged to be adjustable to form a right angle, an acute angle or an obtuse angle between the face frame and the base frame.

[0011] As an additional advantage, the several ends of the resilient members can be either rotatable with respect to the connector they contact, or fixed. One or more of

the base frame first end and the face frame first end are constructed and arranged to be either rotatable or fixed with respect to the first connector, and one or more of the base frame second end and the face frame second end, are constructed and arranged to be rotatable or fixed with respect to the second connector. Thus, several permutations of fixed and rotatable connections can be chosen in order to obtain preferred embodiments whereby the torsional effects of the fixed connections, and the torsion-less effects of the rotating connections can be chosen to result in a frame or trap with desired self-erecting and folding characteristics.

[0012] The connectors and resilient archable members of a frame or trap of the invention can be of any materials suitable for achieving the desired characteristics of the trap or frame. Preferably, a connector or resilient member according to the invention comprises one or more of metals, metallic alloys and synthetic materials. Preferably, the metals, metallic alloys and synthetic materials comprise one or more from the group including aluminum, iron, steel, copper, brass and magnesium, and alloys thereof, and synthetic materials from the group consisting of fiberglass, carbon fiber, synthetic composites, and plastics, such as ABS and glass-filled plastics, and combinations of metals and synthetic materials.

[0013] In accordance with other objects of the invention, a sports trap or frame according to the invention further comprises a net or netting element disposed between at least a portion of the face frame and at least a portion of the base frame. Depending on the embodiment desired, the net or netting element can be disposed over the entire length of the resilient face frame member and the entire length of the resilient base frame member. Nets or netting elements according to the invention can be of any natural or synthetic materials but synthetic materials such as nylon or polyester are preferred because of their light weight and high strength to weight ratios.

[0014] As yet another advantage, the net or netting element of the invention, which can be provided in high-visibility colors, materials and designs, can be disposed such that its mass can be employed to dissipate the inertia of a sports playing object driven or thrown into a trap of the invention. Thus, in some preferred embodiments, a net or netting element can be disposed from at least a portion of the face frame such that a significant portion of the mass of the net or netting element is slackly disposed for absorbing the impact of a sports object propelled within the margins of the frame. Preferably, the significant portion of the net element mass is

at least 25% of the total mass of the net element, or 35% of the total mass of the net. More preferably, the significant portion of the net element mass is at least 55%, or at least 65%, or at least 80% of the total mass of the net element.

[0015] In some preferred embodiments, the net element may be provided with means for holding one or more supplemental weights to increase the mass of the net element such as one or more from the group consisting of pockets or sleeves provided within or on the surface of the net element, clips provided on the net element or on the supplemental weights themselves. All of the net element, the connectors and the frame elements may be provided with means for fastening the device to a playing surface by, for example, clips or stakes. In many preferred embodiments of the invention, the frame can be constructed and arranged to be self-erecting, for example, where the first and the second connectors are attached to the face frame elements and the base frame elements such that the torsional forces incident to the junctions between the connectors and the resilient arcuate members aid in the self-erecting.

[0016] A sports trap or frame of the invention may further comprise strap means disposed between the connectors, or between portions of the base frame adjacent to the connectors, such that the length of the strap means determines the distance between the connectors. Moreover, the length of the strap means of the invention may be provided in adjustable forms so that the relative dimensions of a trap or goal of the invention may be altered as desired.

[0017] Additional advantages of the invention include embodiments wherein a sports trap frame further comprises a halo, wherein the halo is constructed and arranged to be disposed adjacent at least a portion of the face frame and outside the margins of the resilient arcuate member. Preferably, the halo is disposed approximately within the plane formed by the face frame of a trap or frame according to the invention, to thereby increase the visibility of the frame during play, both by the dimensions and the disposition of the halo in relation to the face frame, as well as the high-visibility characteristics of materials from which the halo is preferably made. Preferably, the halo further comprises sleeve or pocket means constructed and arranged for receipt of one or more of lighting means, signage and means for biasing the halo outwardly and generally in the plane of the face frame. Thus, the halo can be provided with lighting, such as 12-volt lighting ropes typically used for decorating automobiles, and can be provided, as examples, with the name of a sports team, a slogan, a logo,

team colors, one or more flags, the flag colors of a country, a product name, a sponsor company name, other advertising and signage material, one or more trademarks or other communications materials.

[0018] Additional advantages of the invention include embodiments wherein a sports trap frame further comprises an apron, wherein the apron is constructed and arranged to be disposed adjacent at least a portion of the face frame and inside the margins of the resilient arcuate member, wherein the apron is disposed to increase the visibility of the frame. Preferably, the apron is disposed approximately within the plane formed by the face frame of a trap or frame according to the invention, to thereby increase the visibility of the trap or frame during play, both by the dimensions and the disposition of the apron in relation to the face frame, as well as the high-visibility characteristics of materials from which the apron is preferably made.

[0019] Moreover, an apron according to the invention preferably further comprises sleeve or pocket means constructed and arranged for receipt of one or more of lighting means, signage and means for biasing the halo outwardly and generally in the plane of the face frame. Thus, the apron can be provided with lighting, such as 12-volt lighting ropes typically used for decorating automobiles, and can be provided also with, for example, the name of a sports team, a product, a sponsor company, team colors or logos, or a decorative design. In some preferred embodiments, an apron of the invention may further comprises sleeve means constructed and arranged for receipt of one or more of lighting means, signage and means for biasing the apron inwardly, for example, a bungee cord or cords..

[0020] Advantageously, sports traps, frames, halos and aprons of the invention may be made of synthetic or natural fibers or fabrics, such as nylon or polyester, or polymer sheeting, and may comprise one or more high-visibility materials, and polymer sheeting. Thus, sports traps, frames, halos and aprons of the invention may comprise one or more materials which are one or more of iridescent, fluorescent, reflective, fringed, transparent, translucent, spangled and partitioned, among other characteristics and materials.

[0021] In another aspect, a sports trap of the invention may further comprise at least one inner target, for example, at least one target disposed within the margins of the face frame. A target according to the invention is constructed and arranged to be disposed within the margins of the face frame, thereby offering a means for users to practice more accurate placement of the sports playing object, such as a soccer ball.

Thus, a sports trap or frame of the invention may include at least one target such as one or more pockets disposed within the net element, one or more target frames suspended from the trap frame or from said net element. In some preferred embodiments, the target frames comprise means for holding a sports playing object when it is propelled to reside within the margins of the target, such as a pocket or sleeve of netting or fabric. In other embodiments, one or more portions of the net element may be provided as a target, for example, in a color contrasting to that of the remainder of the net element.

[0022] Thus, one key aspect, the face frames and base frames of assemblies of the invention, such as traps and goals, are held in a particular desired relationship to one another such that their respective three-dimensional shapes are not dependent totally upon the disposition of any netting element. For example, using any of the connectors shown, or any connector that satisfies the structural and functional performance attendant to the shown connectors, the relative positions of the face frame (and its corresponding plane) and the base frame (and its corresponding frame) can be predetermined. The present invention therefore provides, among other things, a series of frame stabilizing connectors which are disposed to hold the face frame element of the assembly (goal, trap or backstop) upright with respect to the base element of the assembly. Particular embodiments of the present invention that illustrate this feature include those having two connector elements. Each of the connector elements is disposed between the upright, or face frame element, of the goal and the base element of the goal. Thus, as is shown in Figure 4(b), one end of upright resilient element 10 is connected to curved stabilizing connector 3 and at the other end of upright element 10 is connected to curved stabilizing connector 9. The other end of connector 9 is attached to base element 21.

[0023] Frame stabilizing connectors of the invention can be in any shape so long as that shape is disposed to holding an end of an upright face element in a desired relation to the end of a base frame element. Thus, the connector elements of the invention determine primarily the relative position of the face frame with respect to the base frame. Typically, this relationship is such that the face frame element is held approximately perpendicular to the plane of the base element. Thus, when the base element is disposed upon the ground, the face frame element is held substantially perpendicular to the ground. As one of skill in the art of sports equipment design

will appreciate, connectors of the invention can be adapted and arranged to hold the base and face frame planes of the invention at any desired angle or angles.

[0024] Similarly, as one of skill in the art can also appreciate, the stabilizing connectors of the invention include those whereby the respective base frame elements and face frame elements can be disposed in relation to one another at any desired angle, such as an acute angle or angles with respect to the base frame, or an obtuse angle or angles with respect to the base frame. Nonetheless, the angle must be one such that the face frame of the goal provides an opening for reception of the game playing object. Thus, stabilizing connectors of the invention can be in the shape of a spiral or coil, in the shape of a curved element constructed and arranged to receive the respective face frame and base frame elements and hold them in relation to one another, in the shape of a rectangular bracket such as that shown in Figure 9(a), or in the shape of an arcuate bracket such as that shown in Figure 3(b).

[0025] Among the advantages of the "slack net" embodiments of the traps, goals and frame assemblies of the present invention include their ability to assist in dissipating the energy of a sports object, such as a soccer ball, golf ball, lacrosse ball, hockey puck or other sports playing object as the object is driven into the goal. More specifically, because the slack net element hangs down to be disposed in close proximity to the face of the goal, its mass, the totality of which is brought together because of the interconnectedness of its respective webbing strands, slows the ball or other sports playing object such that the object does not bounce back out of the goal. Instead, the object drops to the ground within the confines of the goal. In contrast, goals such as that shown in the Armell patent, U.S. Patent No. 5,433,433, rely on the netting element of the goal to define the relative positions of the upright portions of the goal and of its base. Because of this, the netting element of Armell '433 is held taut between upright and base portions of the goal frame and is thereby much less available to absorb the kinetic energy of a moving sports object such as a soccer ball, golf ball or hockey puck.

[0026] In another key aspect, pop-up frames of the present invention can be adapted and arranged for use in supporting signage, especially of the temporary variety. As well as a netting element, face frames of the invention can be provided with opaque or translucent materials, or vented materials, for example comprising natural or synthetic fabrics, plastics, and other materials suitable as signage or communications media.

BRIEF DESCRIPTIONS OF THE FIGURES

[0027] **Figure 1(a)** shows acute curved tubular connector 51 describing an arc of less than 90 degrees.

[0028] **Figure 1(b)** shows a right-angle curved tubular connector 52 describing an arc of approximately 90 degrees.

[0029] **Figure 1(c)** shows obtuse curved tubular connector 53 describing an arc of more than 90 degrees.

[0030] **Figure 1(d)** shows acute curved connector 51 having an end of face frame flexible element 10 disposed in one end and an end of base flexible element 21 disposed in the opposite end of connector 51.

[0031] **Figure 2(a)** shows extended right angle tubular connector 58 constructed and arranged for receiving ends of a base frame flexible element and a face frame flexible element.

[0032] **Figure 2(b)** shows extended right angle connector 59 with an end of face frame flexible element 10 disposed in the bore of one end of connector 59 and an end of base frame element 21 disposed in the bore of the opposite end of curved element 59.

[0033] **Figure 3(a)** shows bracketed curved connector 71 comprising curved tubular element 72 and bracket 74.

[0034] **Figure 3(b)** shows curved bracketed connector element 71 and the relative positions of end 12 of face frame flexible element 10 and end 14 of base flexible element 21 disposed in the hollows of tubular 72.

[0035] **Figure 3(c)** shows a partial cutaway detail of a curved connector element 73, which is similar to curved connector element 71 shown in 3(b) except that connector 73 is constructed and arranged to allow for the free rotation of end 14 of flexible base element 21 with respect to connector 73.

[0036] **Figure 3(d)** shows rectangular connector element 55 that it is constructed and arranged to hold a base frame member and an upright frame member at approximately a right angle to one another.

[0037] **Figure 3(e)** shows spirally curved connector element 201 that it is constructed and arranged to hold a base member and an upright member at approximately a right angle to one another.

[0038] **Figure 4(a)** is a front view of high visibility soccer goal 41 having high-visibility apron 34.

[0039] **Figure 4(b)** shows a top oblique view of soccer goal 41.

[0040] **Figure 5(a)** shows a front view of lacrosse goal 44 showing high visibility halo 31 disposed on the outside of face frame flexible element 10.

[0041] **Figure 5(b)** shows a top oblique view lacrosse goal 41 showing high visibility halo 31 disposed outside of face frame flexible element 10 which is connected to, and held upright with respect to base flexible element 21 by means of curved connectors 3 and 9.

[0042] **Figure 6(a)** is a front view of golf ball trap 49.

[0043] **Figure 6(b)** is a top oblique view of golf ball trap 49 as shown in Figure 6(a).

[0044] **Figure 7** shows golf ball trap 81 comprising face frame flexible element 10 which defines a margin of the main goal, and inner goal target 85 having rim 84 defining the margins of inner goal opening 83 and netting element 86.

[0045] **Figure 8** shows freestanding sports trap frame 100 including base flexible element 21, face frame flexible element 10, left curved connector 3, right curved connector 9, and pliable tension strap 15.

[0046] **Figure 9(a)** shows a slack-net version sports-playing object trap 100 of the present invention, and a detail of rectangular stabilizing connector 55 disposed at both right and left end corners of the goal. Rectangular connector 55 is similar to that shown in Figure 3(d)

[0047] **Figure 9(b)** shows a slack-net version sports-playing object trap 100 of the present invention, and a detail of spiral stabilizing connector 201 disposed at both right and left end corners of the goal. Rectangular connector 201 is similar to that shown in Figure 3(e)

[0048] **Figure 10** shows extended freestanding sports trap frame 200 including wide red pliable tension strap 215. Face frame top connector 213 connects face frame flexible elements 240 and 220 together.

[0049] **Figure 11(a)** shows a side view of freestanding sports trap frame 100, wherein right connector 9 connects base frame flexible element 21 to face frame flexible element 10 at approximately 90 degrees.

[0050] **Figure 11(b)** shows a side view of freestanding sports trap frame 100 of Figure 11(a) having slack netting element 174 disposed between face frame element 10 and base frame element 21.

[0051] **Figure 11(c)** shows a side view of freestanding sports trap frame 100 having slack netting element 179, which is longer and wider than netting element 174 of Figure 11(b), disposed between face frame element 10 and base frame element 21.

[0052] **Figure 11(d)** shows a side view of the freestanding sports trap frame 100 of Figure 11(c), and having soccer ball 193 shown in flight and impinging upon netting element 179.

[0053] **Figure 12(a)** shows an oblique view of obversible sports-training trap 200 with longer frame element 210 disposed as the trap opening for receiving a sports-playing object.

[0054] **Figure 12(b)** shows an oblique view of obversible sports-training trap 200 with shorter frame element 221 disposed as the trap opening for receiving a sports-playing object.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0055] **Figure 1(a)** shows acute curved tubular connector 51 describing an arc of less than 90 degrees. Thus, rods, tubes or flexible elements disposed partially within, and extending from, curved element 51 will form an obtuse angle with one another.

[0056] **Figure 1(b)** shows right-angle curved tubular connector 52 describing an arc of approximately 90 degrees. Thus, rods, tubes or flexible elements disposed, partially within, and extending from curved element 52 will form an angle of approximately 90 degrees with one another.

[0057] **Figure 1(c)** shows obtuse curved tubular connector 53 describing an arc of more than 90 degrees. Thus, rods, tubes or flexible elements disposed partially within, and extending from, curved element 53 will form an acute angle with one another.

[0058] **Figure 1(d)** shows acute curved connector 51 having an end of face frame flexible element 10 disposed in one end and an end of base flexible element 21 disposed in the opposite end of connector 51.

[0059] **Figure 2(a)** shows extended right angle tubular connector 58 constructed and arranged for receiving ends of frame flexible elements.

[0060] **Figure 2(b)** shows extended right angle connector 59 with end 11 of face frame flexible element 10 disposed in the bore of one end of connector 59 and end 22 of base frame element 21 disposed in the bore of the opposite end of curved element 59. Curved element 59 is also provided with positioning keepers 61 disposed on

the outside of curved element 59 for receipt of other elements such as connector straps or anchors.

[0061] **Figure 3(a)** shows bracketed curved connector 71 comprising curved tubular element 72 and bracket 74. With respect to Fig. 3(a), bracket 74 is provided with apertures 38, 39 and 40 useful as attachment points for such accessories as anchors, connector straps, and goal line positioning aids.

[0062] **Figure 3(b)** shows bracketed curved connector element 71 and the relative of positions of end 12 of face frame flexible element 10 and end 14 of base flexible element 21 disposed in the hollows of tubular element 72. With respect to Fig. 3(b), end 14 of flexible base element 21 is shown disposed within tubular portion 72 of connector 71 and end 12 of face frame flexible element 10 is shown disposed within the bore of upright tubular portion of connector 71.

[0063] **Figure 3(c)** shows a partial cutaway detail of a curved connector element 73, which is similar to curved connector element 71 shown in Figure 3(b) except that connector 73 is constructed and arranged to allow for the free rotation of end 14 of flexible base element 21 with respect to connector 73. Thus, in curved connector element embodiment 73, tubular bore 18 is provided with ring-trapping groove 25 which is disposed for trapping split ring 29 which is disposed in ring groove 28 disposed near end 14 of base flexible element 21.

[0064] **Figure 3(d)** shows rectangular connector element 55 that it is constructed and arranged to hold a base frame member and an upright frame member at approximately a right angle to one another. With respect to Fig. 3(d), end 22 of flexible base frame element 21 is shown disposed within the tubular bore of the rear portion of connector 55, and end 12 of face frame element 10 is shown within the upright tubular bore of the face frame portion of connector 55. Connector 55 is provided with front aperture 191 and rear aperture 190, both in bracket 60, which apertures are useful for attaching accessories, such as anchors or netting elements, to connector 55.

[0065] **Figure 3(e)** shows spirally curved connector element 201 that it is constructed and arranged to hold a base member and an upright member at approximately a right angle to one another. With respect to Fig. 3(e), spirally curved connector element 201 is provided with face frame end 203 for receiving a base frame element, face frame end 205 for receiving a base frame element, slotted loop portion 208, and slotted opening 209. Portions 208 and 209 are useful for attaching

one or more netting elements to the frame, or and for attaching a strap element to each of two connectors of a sports frame in use, and to thereby determine the distance between the two connectors. Portions 208 and 209 are useful also for attaching accessories such as anchors.

[0066] Figure 3(f) shows right angle bracketed connector element 255 that is constructed and arranged to hold a base member and an upright member at approximately right angles to one another. With respect to Fig. 3(f), right-angle connector 255 has base frame arm 244, having aperture 222 for receiving a base frame element. Connector 255 also has face frame arm 245, and bracket 274 disposed between arms 244 and 245 to thereby reinforce each of them. Disposed within bracket 274 is aperture 240, suitable for use as an attachment point or means for attaching a strap to limit the width of the face frame, or for use in anchoring the frame, for example, to the ground or other playing surface. Them

[0067] Figure 3(g) shows a cutaway view of the right angle bracketed connector element 255 shown in Fig. 3(f). With respect to Fig. 3(g), right-angle connector 255 has base frame arm 244, having aperture 222 with base frame element 291 disposed therein and thus disposed in steel ferrule 281. Base frame arm 244 also has polymer ring 272 which is disposed for further reinforcing arm 244 with respect to the forces focused on it by base frame element 291 and face frame element 293. Similarly, face frame arm 245, which is shown with face frame element 293 disposed within steel ferrule 282, is provided with polymer ring 273 which is disposed for further reinforcing arm 245 with respect to the forces focused on it by base frame element 291 and face frame element 293. Reinforcing bracket 274 is disposed between the two arms 244 and 245 to thereby reinforce each of them. Aperture 240 is provided as described with respect to Fig. 3(f).

[0068] Connectors of the invention can be made of any material sufficiently strong to fulfill the needs of holding the frame elements in a fixed, or relatively fixed, position with respect to one another while withstanding the forces and stresses inherent to the use of such devices, including those inherent to the activities of the particular activities and games for which the present devices are suitable. In doing so, the connectors combine with the frame elements to approximate two intersecting planes, that of the face frame, and the plane of the base frame. Suitable materials include, but are not limited to, metals such as aluminum, steel, copper, brass, iron and alloys thereof, and synthetic materials such as fiberglass, carbon

fiber, and plastics, such as ABS and glass-filled plastics, and combinations of metals and synthetic materials.

[0069] Flexible frame elements of the many permutations of the invention can be made of any material sufficiently strong, resilient and flexible enough to fulfill the needs of a particular embodiment of frame elements of the invention, for example, metals such as aluminum, steel, copper, brass, iron and alloys thereof, and synthetic materials such as fiberglass, carbon fiber, and plastics, such as ABS and glass-filled plastics, and combinations of metals and synthetic materials. Materials for use in the invention are selected according to the requirements of the specific embodiments, and particularly with respect to size, thickness, strength and flexibility.

[0070] Figure 4(a) is a front view of high visibility soccer goal 41 having high-visibility apron 34. In Figure 4(a), high visibility apron 34 is disposed within the main opening formed by face frame flexible element 10. With respect to Fig. 4(a), high-visibility apron 34 may comprise any material which is brightly colored, highly reflective, iridescent, fluorescent or luminescent. Such materials include, but are not limited to synthetic or natural fabrics, plastic sheeting or fabric such as nylon or polyester, or fringes comprising these materials. Nylon or polyester fabrics are particularly adaptable for use as aprons for the invention, as are plastics such as Kevlar or Mylar.

[0071] Apron 34 of the invention may be contiguous with the one or more netting elements of the invention and may be provided in sleeve forms, such as those adaptable for use with lighting elements such as light bars, light strings and chemoluminescent lighting elements. Apron 34 of the invention may also comprise one or more sleeves or pocket elements that are adapted and arranged for displaying placards or signs such as those identifying a sports team or sponsor. As an additional advantage, an apron element of the invention may be provided in attachable - detachable form, so that various aprons can be removably provided on a frame of the invention. For example, hook-and-loop fasteners can be provided on mating surfaces so that an apron or aprons may be added or removed as desired. This aspect is particularly advantageous when the names of teams or sponsors are desired to be changed or added to a frame of the invention.

[0072] **Figure 4(b)** shows a top oblique view of soccer goal 41. In Figure 4(b), high visibility apron 34 is shown disposed inside of face frame flexible element 10 and substantially within a plane formed by flexible element 10. Soccer goal 41 is also provided with pliable tension strap 15 disposed between curved connector 3 and curved connector 9 which are constructed and arranged to hold face frame flexible element 10 upright with respect to base flexible element 21.

[0073] High-visibility halo 31 may comprise any material which is brightly colored, highly reflective, iridescent, fluorescent or luminescent. Such materials include, but are not limited to synthetic or natural fabrics, plastic sheeting or fabric such as nylon or polyester, or fringes comprising these materials. Nylon or polyester fabrics are particularly adaptable for use as aprons for the invention, as are plastics such as Kevlar or Mylar.

[0074] Halo 31 of the invention may be contiguous with the one or more netting elements of the invention and may be provided in sleeve forms, such as those adaptable for use with lighting elements such as light bars, light strings and chemoluminescent lighting elements. Halo 31 of the invention may also comprise one or more sleeves or pocket elements that are adapted and arranged for displaying placards or signs such as those identifying a sports team or sponsor. Halo 31 may be supported above and outside of frame element by any means which provides support for a substantial portion of the halo, such as a flexible support element comprising wire or fiberglass disposed within a sleeve of halo 31 and having its ends disposed within pockets proximate to the stabilizing connectors of the invention. As an additional advantage, a halo element of the invention may be provided in attachable – detachable form, so that various halos can be removably provided on a frame of the invention. For example, hook-and-loop fasteners can be provided on mating surfaces so that an apron or aprons may be added or removed as desired. This aspect is particularly advantageous when the names of teams or sponsors are desired to be changed or added to a frame of the invention.

[0075] **Figure 5(a)** shows a front view of lacrosse goal 44 showing high visibility halo 31 disposed on the outside of face frame flexible element 10. With respect to Fig. 5(a), high visibility halo 31 includes placard sleeve or area 36 constructed and arranged for displaying a team name, sponsor name or motto, etc.

[0076] **Figure 5(b)** shows a top oblique view lacrosse goal 41 showing high visibility halo 31 disposed outside of face frame flexible element 10 which is connected to,

and held upright with respect to base flexible element 21 by means of curved connectors 3 and 9. Lacrosse goal 41 is also provided with netting 16 disposed between base flexible element 21 and face frame flexible element 10.

[0077] **Figure 6(a)** is a front view of golf ball trap 49. Golf ball trap 49 includes high visibility halo 31 and high visibility apron 34. High visibility halo 31 is disposed outside of face frame flexible element 10 while high visibility apron 34 is disposed inside of face frame flexible element 10 to thereby provide a high visibility aspect ratio.

[0078] **Figure 6(b)** is a top oblique view of golf ball trap 49 as shown in Figure 6(a). With respect to Figure 6(b), high visibility apron 34 is shown disposed inside of face frame flexible element 10, and high visibility halo 31 is shown disposed outside face frame flexible element 10.

[0079] **Figure 7** shows golf ball trap 81 comprising face frame flexible element 10 which defines a margin of the main goal, and inner goal target 85 having rim 84 defining the margins of inner goal opening 83 and netting element 86. With respect to Figure 7, inner goal target 85 is suspended from frame flexible element 10 by a plurality of suspension straps to provide a "goal within a goal." The goal-within-a-goal is smaller than that formed by flexible frame element 10, and therefore more difficult to hit with as game-playing object, such as a hockey puck or golf ball.

[0080] **Figure 8** shows freestanding sports trap frame 100 including base frame flexible element 21, face frame flexible element 10, left curved connector 3, right curved connector 9, and pliable tension strap 15. In some embodiments, tension strap 15 is provided in a length-adjustable form so that the distance between connectors 3 and 9, and thus the distance between the ends of face frame element 10, can be adjusted to make the face opening wider, narrower, taller, or of a different shape. Strap 15 can be rendered adjustable, for example, by a buckle or slide adjuster as is known in the sporting goods arts. With respect to Fig. 10, connectors 3 and 9 can be of any configuration which fulfills the key parameter of a connector of the invention, that is, a connector is constructed and arranged to hold the ends of face frame flexible element 10 in a desired position with respect to the ends of base flexible element 21. For example, one or more of spiral connector 201, rectangular connector 55, bracketed curved connector element 71, connector element 73, or curved connectors 51, 52, 53, 58 and 59 can be used to fulfill this function.

[0081] Face frame element 10 and connectors 3 and 9 join to approximate a plane. Similarly, base frame element 21 and connectors 3 and 9 join to approximate a plane. Thus, in its playing position, the plane of the face frame is held at a substantially fixed angle to the plane of the base frame. This fixed angle is preferably within 25 degrees of 90 degrees, that is, the planes of the base frame and face frame are held within 65 degrees to 115 degrees with respect to one another, and more preferably within 15 degrees of 90 degrees, that is, the planes of the base frame and face frame are held within 75 degrees to 105 degrees of one another.

[0082] A significant element of sports trap frame 100 is that it is freestanding, that is, in its unfolded (playing) position, with base frame flexible element 21 disposed on a playing surface such as the ground of a field or the floor of a gymnasium, face frame flexible element 10 is held upright without the need of a netting element. Because of this freestanding characteristic, one or more netting elements can be draped from face frame flexible element 10 such that they cascade toward the ground to be disposed near the plane formed by face frame element 10. Thus, in some preferred embodiments, the amount, or length, of netting provided is significantly more than that required to bridge the distance between the rear portion of base frame element 21 and the top portion of face frame element 10.

[0083] Disposed in such a "slack-net" position, the mass of the netting element of the invention is available to dissipate the kinetic energy of a sports playing object, such as a soccer ball, hockey puck, golf ball, football or lacrosse ball which is driven or thrown into it. In contrast, portable nets such as those shown in U.S. Patent 5,433,433 to Armell rely upon the netting element to control the distance between the base element and the vertical, or upright, element. Thus, the netting element of Armell is held tautly in tension and would tend to deflect an object driven into it downwardly and outwardly much more than a slack net version of the present invention. Thus, the sports goal of Armell would tend to deflect the playing object back toward the playing field.

[0084] Figure 9(a) shows a slack-net version of sports-playing object trap 100 of the present invention, and a detail of rectangular stabilizing connector 55 disposed at both right and left end corners of the sports training goal. With respect to Fig. 9(a), rectangular connector 55 is similar to that shown in Figure 3(d). In Figure 9(a), end 11 of face frame flexible element 10 is shown disposed within rectangular connector 55. Rectangular connector 55 is provided with apertures 190 and 191.

Also, end 22 of base frame element 21 is shown disposed within element reception portion 57 of rectangular connector 55. Moreover, end 11 of face frame element 10 is shown disposed within face frame portion 54 of connector 55.

[0085] **Figure 9(b)** shows a slack-net version sports-playing object trap 100 of the present invention, and a detail of spiral stabilizing connector 201 disposed at both right and left end corners of the goal. With respect to Fig. 9(b), rectangular connector 201 is similar to that shown in Figure 3(e).

[0086] **Figure 10** shows freestanding sports trap frame 200 including base frame flexible element 21, first face frame flexible element 240, second face frame flexible element 220, left curved connector 3, right curved connector 9, and wide red pliable tension strap 215. Face frame top connector 213 connects ends of first face frame flexible element 240 and second face frame flexible element 220 together. Thus, the absolute length of the face frame, and thus the size of the goal opening, can be varied or adjusted by the selection of face frame elements 220 and 240 of appropriate lengths. Wide tension strap 215 is preferably provided in a bright color such as red or yellow, or it can be provided in white, for example, to match a chalked goal line. Additional face frame flexible elements can be provided as desired in order to adjust or vary the relative size of the face frame.

[0087] In some preferred embodiments of sports trap frame 200, tension strap 215 is provided in a length-adjustable form so that the distance between connectors 3 and 9, can be adjusted to make the face opening wider, narrower, taller, or of a different shape. In other preferred embodiments, tension strap 215 can be disposed more forwardly to have its front margin align with the plane of the face of sports trap frame 200, which can be aligned with the goal line of a playing field or area. Moreover, strap 215 can be provided in a width identical to the width of the goal line with which it will be used.

[0088] **Figure 11(a)** shows a side view of freestanding sports trap frame 100, wherein right connector 9 connects base frame flexible element 21 to face frame flexible element 10 at approximately 90 degrees. Thus, face frame element 10 approximately describes, and lies substantially within, the face plane of the trap, and base frame element 21 approximately describes, and lies substantially within, the base frame plane of the trap.

[0089] **Figure 11(b)** shows a side view of freestanding sports trap frame 100 of Figure 11(a), and further comprising slack netting element 174 disposed between face

frame element 10 and base frame element 21. The dimensions, that is, the length and width of netting element 174, are such that it is not taut, and it forms curvature R1 between frame elements 10 and 21 when the trap is at rest and in its playing position.

[0090] **Figure 11(c)** shows a side view of freestanding sports trap frame 100 having slack netting element 179, which is longer and wider than netting element 174 of Figure 11(b), disposed between face frame element 10 and base frame element 21.

[0091] The dimensions of netting element 179, that is its length and width, are such that it is not taut, and it forms curvature R2 between frame elements 10 and 21 when the trap is at rest and unfolded into its playing position. The dimensions of netting element 179 are longer and wider than netting element 174, such that element 179 drapes from face frame element 10 so that more of the net is disposed toward the face and base of trap 100 than the quantity of netting element 174 as shown in Figure 11(b). Netting 179 thus forms curvature R2, which is of a smaller radius than curvature R1. Because of this, the mass of netting element 179 is disposed more forwardly in trap 100 and is thereby available to absorb the kinetic energy of a sports object driven into it, such as a hockey puck, golf ball, soccer ball or lacrosse ball.

[0092] **Figure 11(d)** shows a side view of the freestanding sports trap frame 100 of Figure 11(c) but having soccer ball 193 shown in flight and impinging upon netting element 179. With respect to Figure 11(d), the kinetic energy of soccer ball 193 distends netting element 179 such that the mass of the netting element absorbs a sufficient amount of the kinetic energy of ball 193, that it is likely to be trapped within the borders of sports trap 100. In doing so, distended netting element 179 temporarily forms curvature R3, which is of a shorter radius than that of R2.

[0093] As one of skill in the art can appreciate, many other embodiments of the slack-net versions of the invention are possible within the scope of the invention, and particularly advantageous are those having an even greater proportional amount of netting element. Some desired embodiments include those netting elements which are of sufficient dimension to contact all of the surface encompassed by base flexible element 21, and of even greater dimensions (not shown). By providing more net than is necessary to span the shortest distance between the margins of frame elements 10 and 21, the present invention allows the mass of the netting element to be available for absorbing the energy of a sports playing object.

[0094] Figure 12(a) shows an oblique view of obversible sports-training trap 200 with longer frame element 210 disposed as the trap opening for receiving a sports-playing object, and shorter frame element 221 disposed as the base for trap 200. Sports-training trap 200 is constructed and arranged such that either frame element can be disposed toward a playing field to thereby provide a goal or trap which can be disposed with either of its two openings as the target in use. Thus, trap 200 provides goals or traps of different sizes.

[0095] Figure 12(b) shows an oblique view of obversible sports-training trap 200 with shorter frame element 221 disposed as the trap opening for receiving a sports-playing object, and longer frame element 210 disposed as the base for trap 200. In accordance with other aspects of the invention, the frame element connectors of obversible sports-training sports object trap 200 can be of any configuration which fulfills the key parameter of a connector of the invention, that is, that it be constructed and arranged to hold the ends of face frame flexible element 10 in a desired position with respect to the ends of base flexible element 21. For example, one or more of spiral connector 201, rectangular connector 55, bracketed curved connector element 71, connector element 73, or curved connectors 51, 52, 53, 58 and 59.

[0096] In accordance with the several objects of the invention, numerous permutations and embodiments of a pop-up frame assembly suitable for holding a netting element are provided. In one class of embodiments of the invention, the frame assembly comprises at least one resilient face frame element, the face frame element having a base first end and a base second end, at least one resilient base frame element, the base frame element having a base first end and a base second end, a first connector, the first connector having a face fitting which is constructed and arranged to connect the first end of the face frame element to the first end of the base element, and a base fitting which is constructed and arranged to connect the first end of the face frame element to the first end of the base frame element, and a second connector, the second connector having a face fitting which is constructed and arranged to connect the second end of the face frame element to the second end of the base element, and a base fitting which is constructed and arranged to connect the first end of the face frame element to the first end of the base frame element. In some preferred embodiments, a pop-up assembly of the invention may further comprise at least one netting element.

[0097] The pop-up assembly may further comprise at least one interposable face frame element, such as a rod or tube, and at least one corresponding connection member for connecting the interposable face frame element to the resilient face frame element. In accordance with other objects, a pop-up assembly of the invention may further comprise an apron disposed within the margins formed by the face frame element, and may yet further comprise a halo disposed outside of the margins formed by the face frame element. Preferably, each of the halo and apron comprise at least one high-visibility material.

[0098] The frame flexible elements of the invention can be provided in the form of rods or tubes which are constructed and arranged to fit within, or on the outside of, portions of the connectors. Moreover, frame elements of the invention can also be provided in pre-bent angles or shapes in order to provide for face frame openings of desired shape and dimensions.

[0099] As those of skill in the art will appreciate, numerous permutations of the invention are possible within the metes and bounds of the claims herein. Thus, although the present invention has been described with reference to the preferred embodiments, variations and modifications of elements and components of the invention can be substituted therefor while remaining within the spirit and scope of the invention.